



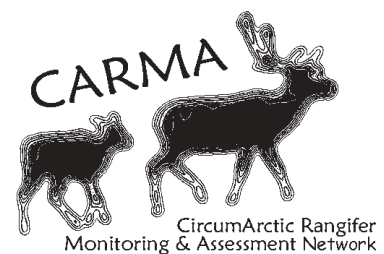
Expert Network Monitoring Plan

HUMAN-WILD RANGIFER SYSTEMS

Supporting Publication to the
Circumpolar Biodiversity Monitoring Program
Framework Document



Conservation of Arctic Flora and Fauna



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Environment Canada, Ottawa, Canada

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Directorate for Nature Management, Trondheim, Norway

Russian Federation Ministry of Natural Resources, Moscow, Russia

Swedish Environmental Protection Agency, Stockholm, Sweden

United States Fish and Wildlife Service, Anchorage, Alaska

This publication should be cited as:

CAFF 2006. Human-Wild *Rangifer* Systems. Expert Network Monitoring Plan.

Supporting publication to the CAFF *Circumpolar Biodiversity Monitoring Program*

– *Framework Document*. By CARMA in cooperation with CAFF.

CAFF CBMP Report No. 11, CAFF International Secretariat, Akureyri, Iceland.

Cover photo:

A July aggregation of the Porcupine Caribou Herd
near the Yukon/Alaska border.

Photo courtesy of Debbie van de Wetering.

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Update Report

CAFF CBMP Report No. 11
October 2006

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CARMA Mission

To monitor and assess the impacts of global change on the Human-Rangifer system across the circum-Arctic, through cooperation, both geographically and across disciplines.

Background

In February 2000, the Conservation of Arctic Flora and Fauna Working Group of the Arctic Council (CAFF), met in Iceland to respond to an Arctic Council recommendation that a circumpolar monitoring network be established. The Circumpolar Biodiversity Monitoring Program (CBMP) was endorsed by Arctic Council Ministers in 2004. Under the CBMP, there are several species monitoring networks. CAFF proposed that one of the networks monitor *Rangifer* populations and the human interactions with this important resource. After a number of small, preliminary meetings the *Rangifer* network, officially called the CARMA Network (CircumArctic Rangifer Monitoring and Assessment Network), was launched at an international meeting in Vancouver, Canada in November 2004. The highlights of that meeting were:



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- Attended by 35 representatives from seven circum-Arctic countries; from universities, governments, aboriginal organizations; representing expertise in social science, physical science and biological science.
- Agreed on name of network and logo
- Adopted the mission statement
- Developed and adopted an organizational structure
- Developed website and discussed a communication strategy
- Developed a preliminary list of indicators
- Discussed data sharing and data management

CARMA held a second annual meeting in November 2005.

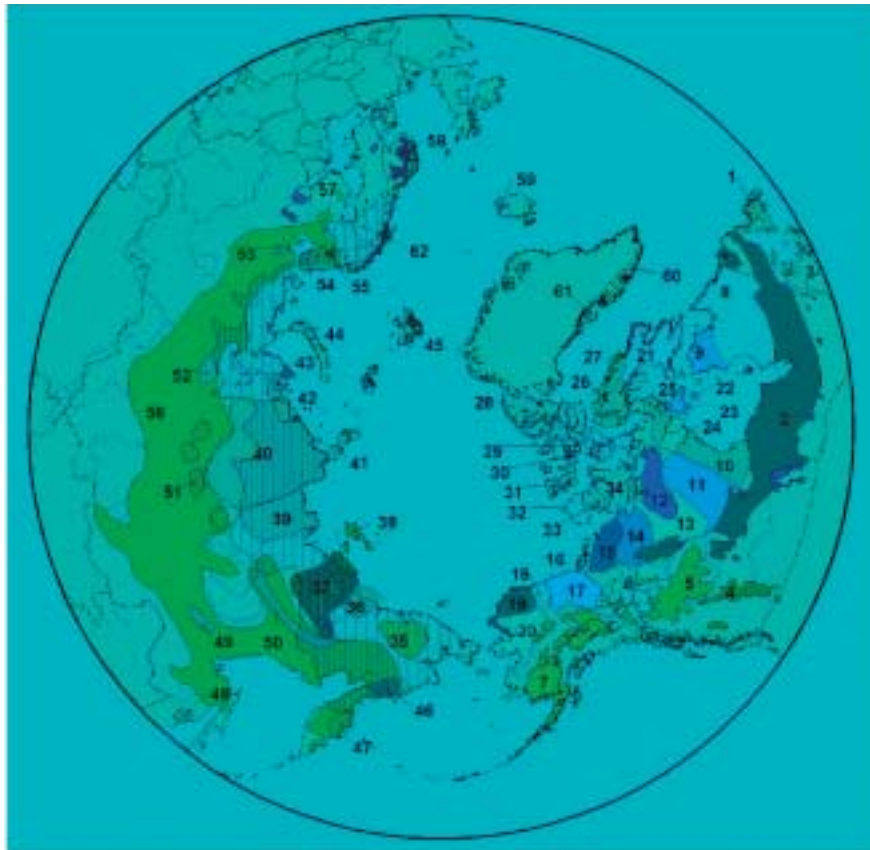
Considerable time was spent further developing the indicators and identifying “champions” who would propose standardized protocols. The second focus of the meeting was to outline a CARMA proposal to be submitted for International Polar Year funding.

The following report represents the current status of the CARMA Network based on discussions at these first two official annual meetings.



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Figure 1: Circumpolar distribution of *Rangifer* herds



- | | | | | | |
|----|---------------------|----|----------------------------------|----|-------------------------------|
| 1 | Newfoundland | 22 | Coats Island | 43 | Belyi |
| 2 | Boreal | 23 | Southampton Island | 44 | Novaya Zemlia |
| 3 | Atlantic | 24 | Lorillard | 45 | Svalbard |
| 4 | Southern Mountain | 25 | Wager Bay | 46 | Parapolskii |
| 5 | Northern Mountain | 26 | North Baffin Island | 47 | Kamchatka |
| 6 | Yukon | 27 | Northeast Baffin Island | 48 | Amur |
| 7 | Alaska | 28 | Eastern Queen Elisabeth Island | 49 | Okhotsk |
| 8 | George River | 29 | Bathurst Island | 50 | Yakutsk |
| 9 | Leaf River | 30 | Prince Of Wales-Somerset-Boothia | 51 | Evenkiya |
| 10 | Qamanirjuaq | 31 | Western Queen Elisabeth Island | 52 | Nadym-Pur (Yamal Okrug) |
| 11 | Beverly | 32 | Banks Island | 53 | Arkhangelsk Oblast |
| 12 | Ahiak | 33 | Northwest Victoria | 54 | Terskiill Bereg (Kola) |
| 13 | Bathurst | 34 | Dolphin-Union | 55 | Laplandskii Zapovednik (Kola) |
| 14 | Bluenose East | 35 | Chukotka | 56 | Range of Forest Reindeer |
| 15 | Bluenose West | 36 | Sudrunskaya | 57 | Finland |
| 16 | Cape Bathurst | 37 | Yana-Indigirka | 58 | Norway |
| 17 | Porcupine | 38 | Novosibirski Ostrova | 59 | Iceland |
| 18 | Central Arctic | 39 | Lena-Olenek | 60 | Greenland |
| 19 | Teshekpuk | 40 | Taimyr | 61 | Greenland Feral Reindeer |
| 20 | Western Arctic | 41 | Severnaia Zemlia | 62 | Range of Domestic Reindeer |
| 21 | South Baffin Island | 42 | Gydan | | |

Principles and Scope of the Network

1. *Focus on wild Rangifer populations.*

The network is initially concerned with large migratory *Rangifer* herds and their human user communities, thus less emphasis is placed on woodland/forest and Peary/marine *Rangifer* populations. However, there are issues related to wild populations that also impact domestic reindeer enterprises. The network will consider the magnitude and trends of interactions that incidentally affect domestic populations, particularly in Russia and Alaska.

The CARMA network will link with similar networks concerned with domestic reindeer issues to ensure approaches are complimentary.



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2. *Be simple and relevant.* There is tremendous depth and breadth of activities in managing and assessing the status of *Rangifer* populations in the circumpolar North. It is impossible for any network to try to include all these activities. The success of the network will depend on our ability to identify the common, relevant indicators that, when examined on a circumpolar basis, help our partners better understand their herds and the factors that impact their well-being.

3. *Be dynamic; herd-specific data can be added at any time.* We propose an open

network where new herds, regions, indicators and partners can be added on an ongoing basis.



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4. *Be a central depository for historical and current information on Rangifer indicators.* The communication tools will be web-based and will serve as a site that researchers, managers, and co-management groups can visit to obtain up-to-date information on *Rangifer* herds.

5. *Include community, industry, university, and agency-based monitoring information.* The network will access existing information from a number of sources and integrate them where feasible. Local knowledge, field-based biological monitoring, and remote sensing are all considered critical elements in the CARMA Network, and provide an important means for linking scales of analysis to arrive at a complete picture of regional and circumpolar perspectives. As funding for a comprehensive CARMA Network is at present very limited, activities will initially focus on using existing monitoring activities rather than initiating new data-collection initiatives.

6. *Provide annual analysis of Rangifer-relevant indicators across the circumpolar North.*

On an annual basis, the network will provide a circum-Arctic summary of the status of indicators of the human-*Rangifer* system.



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with a number of partners in Russia and Fennoscandia. IASC funds provided support for several partners to attend the official launch of the CARMA Network in 2004.

- **Canada's Climate Change Action Fund (CCAF):** CCAF provided funds to develop indicators and support for the organization of the 2004 launch.

Acknowledgements

CARMA coordinators have received funding from a number of sources to help launch the network.

- **U.S. National Science Foundation/Arctic Systems Science Program in the Office of Polar Programs:** Through the "Sustainability of Arctic Communities" project and the current "Heterogeneity and Resilience of Human *Rangifer* System Synthesis" project, we are testing a model of community-based ecological monitoring and are assembling historical data for many barren ground caribou populations.
- **Northern Ecosystem Initiative (NEI):** Environment Canada's NEI provided funding to develop some of the indicators (e.g. harvest data, body condition data), and conduct protocol workshops. NEI was the primary sponsor of the official launch of the CARMA Network in 2004.
- **International Arctic Science Committee (IASC):** IASC has funded a project on the "Human Role in Reindeer/Caribou Systems" to stimulate international research. IASC funding has provided opportunities to meet

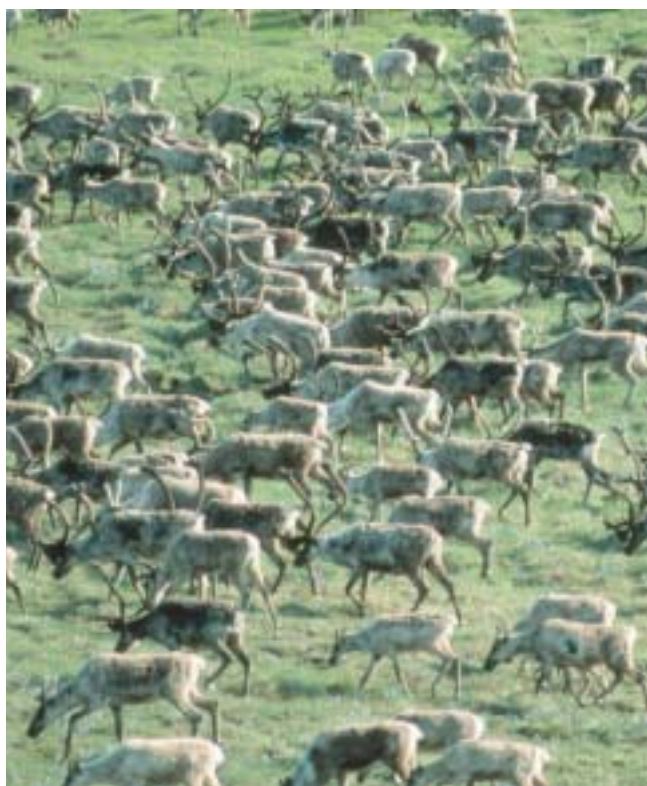


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7. *Provide a forum for standardized protocols in collecting, documenting, and assembling indicators.* Although not requiring standardized protocols, the network will provide recommended protocols that are available to monitoring programs. Providing standard protocols at this time, will gradually allow participants to modify existing or initiate new monitoring programs whenever feasible. Ongoing feedback from participants will serve to adapt and improve protocols as needed.

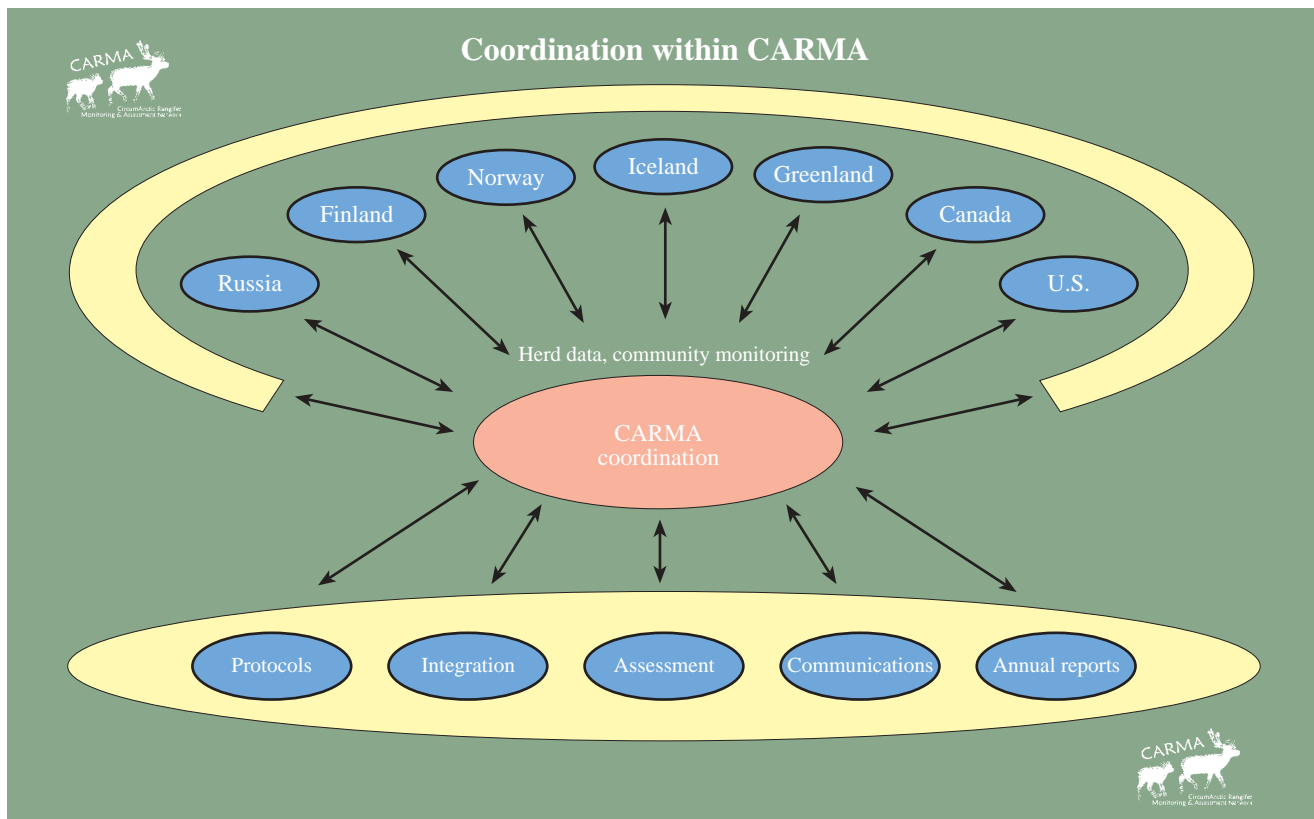
8. *Provide annual "value-added" indicators that all regions can share.* A major value-added benefit of the network will be the provision of a circumpolar compilation of annual climatic and habitat conditions. Indicators such as snow conditions (depth, water equivalent), snow melt and green-up can be provided utilizing existing projects that provide this information on a periodic basis. We will use these existing projects and target seasonal ranges of specific herds.

9. *Provide a forum for exchange of ideas.* Using the web-based communication tools, we are able to provide a site for an informal exchange of ideas, observations and activities.

Network Organization

The coordination of the CARMA Network will rely on information from partner countries regarding their wild herds and observations from their communities. As well, circum-arctic monitoring data from existing remote sensing platforms (i.e. satellite, weather stations) will be obtained. All of these data will be integrated and periodic reports and assessments produced. Figure 2 summarizes the flow of information and products produced by the CARMA Network. The Canadian Wildlife Service of Environment Canada and the Institute of Arctic Biology of the University of Alaska are prepared to serve as interim coordinating organizations for the CARMA Network during its start-up phase.

Figure 2: Flow of information and products produced by CARMA



CARMA International Polar Year Project

With direction from the 2nd annual CARMA meeting, coordinators submitted a proposal to the Canadian IPY committee.

Synopsis: The goal of this project is to improve understanding of the relative resilience and vulnerability of regional Human-*Rangifer* Systems to climate change. A Human-*Rangifer* System is defined here at the regional scale as the set of ecological and social processes underlying the human use of wild *Rangifer*. Human-*Rangifer* Systems have historically provided and continue to provide keystone ecosystem services to indigenous residents, with *Rangifers* being the most

important terrestrial subsistence resource of the Arctic System.

Our work is motivated by the almost universal projections of significant changes in regional climates across the circumpolar north, at a time when more demands are being placed on the extraction of non-renewable resources in these regions.

Our primary tool will be comparative synthesis and assessment at a circumpolar scale, appreciating the fact that climate changes across the north are extremely heterogeneous. Rather than view this complexity as a challenge, in this proposed project, we view the heterogeneity of the Arctic System as an opportunity, providing a set of natural experiments to address research questions through comparative analysis.

Project Objectives:

Long Term:

Assess the resilience and vulnerability of Human-*Rangifer* Systems across the circum-Arctic through coordinated knowledge collection and sharing and, using this multi-disciplinary exchange, develop and promote adaptive strategies and policies that will ensure a sustainable Human-*Rangifer* future.

Short Term:

1. Create a circumpolar database of existing data on tundra-dwelling, wild *Rangifer*.
2. Support the development, design, testing and implementation of standardized monitoring protocols to assess the impacts of climate change on Human-*Rangifer* Systems.
3. Facilitate two years of coordinated, standardized and intensive monitoring of selected "reference herds" across the circum-Arctic.
4. Using comparative analysis, test a number of research questions through retrospective analysis of existing data (from #1), and data generated through the circumpolar monitoring program (from #3).
5. Undertake a circumpolar assessment and report through scientific publications, popular articles, web sites and university-level curriculum on the status of Human-*Rangifer* Systems, highlighting, where feasible, stressors, degrees of vulnerabilities and resilience.
6. Develop, implement and evaluate decision-support tools that allow for a meaningful dialogue between northern residents, resource managers, and project partners, to help facilitate the development of adaptive responses through policies and practices that support sustainability of herds and their user communities.
7. Evaluate the project, making recommendations to the CARMA Network on priority-setting into the next decade.

CARMA Network linked to Research Projects

One of the roles of the CARMA Network is to help in the coordination and integration of *Rangifer*-related research. Primarily through the IPY process, in which CARMA was identified as an international network cluster lead, CARMA was linked to a number of ongoing and proposed research projects.

CAFF Working Group of the Arctic Council: Circumpolar Biodiversity Monitoring Program (CBMP): The CBMP is an international network of key scientists and conservation experts from eight Arctic countries, as well as six indigenous organizations. The CARMA Network is one of the species networks that will form part of the CBMP. CBMP and CARMA will work together to ensure that remote sensing monitoring and data management are coordinated and compatible.

Canada: A network of automated weather stations for the Sahtu Settlement Area. This project is related to CARMA in that data collected will be valuable to validate remote sensing data on green-up, snow accumulation, and snow melt within the ranges of three barren-ground herds.

Canada: Resilience of Caribou and Reindeer Populations: Validation and Application of the Filter Paper Technique to Assess Exposure to Pathogens during International Polar Year(s). The proposed research program will complement CARMA by developing and validating techniques that can be employed by the CARMA monitoring program. The project will determine if blood on filter paper, collected and stored under conditions that would be typical in the Arctic/Subarctic, can be used to reliably detect presence or exposure to various important pathogens of *Rangifer*.

USA/Canada: Resource allocation for nitrogen balance in Rangifer: the body-diet continuum. This project also is related to CARMA as its goal is to develop an operational technique to determine: 1) How do timing of birth and food intake affect the maternal allocation of energy and nitrogen (protein) in *Rangifer*; and 2) How do winter diet and nitrogen balance vary within and between wild *Rangifer* herds?

USA: Heterogeneity and Resilience of Human-Rangifer Systems: A Circumpolar Social-Ecological Synthesis. This project complements the CARMA project by advancing the science of resilience / vulnerability assessment by focusing on six regional case studies. Each case will be examined by: 1) Conducting a retrospective analysis of change in our case study regions to understand driving factors and internal processes; 2) Conducting comparative analysis of regional case studies to understand heterogeneity and its implications to resilience and vulnerability; 3) Developing rule-based simulation models for exploring system dynamics. Leads for this project are also key collaborators within the CARMA project.

Norway: Rangifer – a circumpolar resource in a changing climate. This project will forecast the effects of global climate change on *Rangifer* by using prehistoric and historic data. Through linkages with other IPY activities, the project will facilitate translation and outreach of the research to ensure the sustainability of *Rangifer* ecosystems and their relationship to indigenous people.

Norway: Arctic Vulnerability Network Study: Reindeer Herding in a Changing Climate- Coping Mechanisms and Adaptive Capacity (EALAT). EALAT is a parallel project to CARMA (and also a network under the CBMP) focusing on domestic reindeer herding in Arctic and sub-Arctic Eurasia. Its approach is holistic, integrating social and natural science and users' understanding in the co-production of

knowledge. CARMA (confined to wild herds and hunting) has held meetings with the EALAT coordinator and will ensure methodologies are compatible and transferable.

Russia: Study of spatial and temporary dynamics of reindeer populations (on a sample {Taimyr} population). This project will provide important data to include the Taimyr wild reindeer herd (possibly the largest in the world) as one of CARMA's reference herds.

Denmark (Greenland): VICAFE: Virtual Caribou/Reindeer in a Future Environment. This project proposes to create a virtual caribou / reindeer herd, which despite changing climate conditions permits predictions about how the herd will move through and use its environment (range) as well as about productivity / reproduction and herd size. The virtual herd will be a useful tool for Arctic communities, which are dependent upon caribou / reindeer.

Future Plans

CARMA's 3rd annual meeting will take place in Vancouver in November 2006 and will focus on coordinating and implementing successful IPY projects under the CARMA umbrella.



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Websites

<http://www.rangifer.net/carma/meetings/vancouver2004.html>

<http://www.rangifer.net/carma/meetings/vancouver2005.html>

http://taiga.grida.no/carma/vancouver2005_svein_mathiessen.ppt